



PERMOS DOI – Table Description

v. May 2024

1 Introduction

The PERMOS data base is organized in three levels of data as shown in Figure 1. Published data (DOI releases) include the products and relevant metadata.

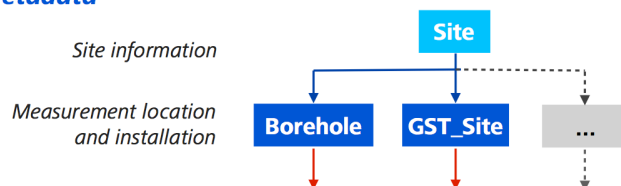
1. The *Metadata Tables* include all information about the measurement sites and the installations.
2. The *Data Tables* hold the data measured in the field.
3. The *Data Products* are directly derived from the data tables to provide standardized versions of the data and information that are derived from the measurements, such as temporal aggregations or derived parameters like active layer thickness or creep velocity. Data with dubious quality are not included to calculate product tables.

Data quality control is applied to the data when it is written to the database (basic quality control) as well during repeated data curing activities by the data managers.

The PERMOS data base is a relational PostgreSQL data base running on an Ubuntu server at the Department of Geography, University of Zurich (www.geo.uzh.ch). Data can be visualised and downloaded via the PERMOS Data Portal at <https://www.permos.ch/data-portal>. All data are subject to the PERMOS Data Policy (CC-BY 4.0), where details regarding the use and citation are also described: https://www.permos.ch/fileadmin/Files/PERMOS_docs/PERMOS_DataPolicy.pdf.

This document describes the content of the data tables included in the **PERMOS DOI release 2024**. For more information or question contact the PERMOS office at office@permos.ch.

Metadata



Data



ID	Borehole_ID	Depth	Time	Temp	PFlag	QFlag	Timestamp
1	3	10	2013-07-11 16:15:00	-1.256	b	1	2013-07-11 16:15:00

Proc. Quality Versioning

Products

Aggregations

hourly | daily | annual | hydr. year | FDD

Standard views

Temps per borehole | gst-site

- ★ performance
- ★ easy access and standard views
- ★ data exchange with predefined data sets
- ★ standard processing

no data manipulation!

Fig. 1: Organisation of tables in the PERMOS Data Base: metadata, data and product tables.

2 General metadata tables

2.1 Sites

General information about the measurement sites and data acquisition for all types of measurements

Field	Description
id	Site ID (only used for reference within the database) Auto increment: nextval('site_id_seq'::regclass)
abbr	Site abbreviation
name	Site name
alter_name	Other frequently used name for the site
permos	Site of the PERMOS network and/or the TEMPS Project? 0: neither PERMOS nor TEMPS site 1: PERMOS site (i.e., it is also a TEMPS site) 2: PERMOS reference site (i.e., it is also a TEMPS site) 3: TEMPS site only
country	Country abbreviation
region	Region, where the site is situated. For the Swiss sites, the major political regions are used (Fig. 2)
landforms	Observed landform(s) at the site
lithology	Lithology (predominant rock type) of the site
e	Approximate location in Swiss national coordinates (LV03), E-W direction) non-CH sites: -999
n	Approximate location in Swiss national coordinates (LV03), N-S direction) non-CH sites: -999
lat	Geographic coordinates, latitude (decimal degrees)
lon	Geographic coordinates, longitude (decimal degrees)
h_min	Approximate altitude range (m a.s.l.) of the measurement installations, min elevation
h_max	Approximate altitude range (m a.s.l.) of the measurement installations, max elevation
comment	Additional comments, such as a short site description or a reference to an article describing the site in more detail
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

2.2 pi

Information about the principal investigators (PI) or contact persons for the measurements

Field	Description
id	PI ID (only used for reference within the database)
abbr	Abbreviation used for the PI
last_name	Last name
first_name	First name
institute	Acronym for the responsible institute
email	Email address
office	Phone number office
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)

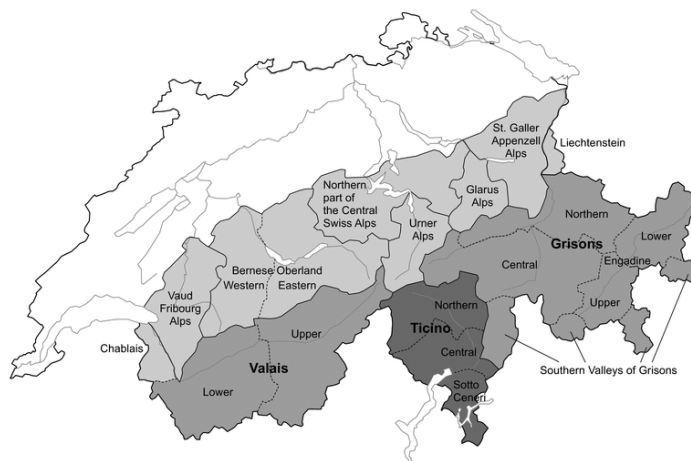


Fig. 2: Political units as used in the field *Region*:
Picture taken from
http://www.slf.ch/lawineninfo/zusatzinfos/interpretationshilfe/geographische_begriffe/karte_polit_geogr_e.gif.

3 Borehole tables

3.1 Metadata

3.1.1 Borehole

Information about the individual boreholes and their location.

Field	Description
id	Borehole ID (only used for reference within the database)
name	Borehole name: site abbreviation, underscore, number of the borehole, year drilled, e.g. SCH_5198
alter_name	Alternative name(s) of the borehole
site_id	ID of the corresponding measurement site.
year	Year, when the borehole was drilled (YYYY)
active	Measurements ongoing? Either 1 or the year, when measurements were stopped (YYYY).
project	Network / project, the borehole is affiliated with
gtnp_id	ID the borehole is addressed within GTN-P (GTN-P Code)
gtnp_dms_id	ID of the GTN-P data management system (Borehole Code)
calm_id	ID of the borehole within the Circumpolar Active Layer Monitoring CALM
e	Exact location in Swiss national coordinates (LV03 reference frame) non-CH sites: –999
n	Exact location in Swiss national coordinates (LV03 reference frame) non-CH sites: –999
h	Altitude (m a.s.l.)
lat	Geographic coordinates, latitude (decimal degrees)
lon	Geographic coordinates, longitude (decimal degrees)
depth	Original depth of the borehole, when it was drilled (m)
inc	Inclination (i.e., deviation from the vertical) of the borehole (°)
slp	Slope of the borehole site (°). For boreholes all the way through a crest, the information for the slope closest to the «uppermost» sensor is given.
asp	Aspect of the borehole site (°) For flat locations: –999
morphology	Morphology of the measurement location [crest moraine rock glacier solifluction lobe talus slope]
surf_type	Surface (material) at the measurement location [bedrock coarse blocks debris vegetation]
pf_thick	Estimated permafrost thickness at the borehole location
class	Borehole class according to GTN-P: SU: Surface: <10 m SH: Shallow: 10–25 m IB: Intermediate: 25–125 m DB: Deep: >125 m
comment	Additional comments
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

3.1.2 bh_inst

Information about the instrumentation of the boreholes.

Field	Description
id	Record ID (only used for reference within the database)
borehole_id	ID of the corresponding borehole.
beg_date	Date from when the installation information is valid.
end_date	Date until when the installation information is valid. For currently valid records TO is set to '2100-01-01'.
pi_id	ID of the responsible PI
low_sensor	Depth of the lowest working thermistor (m)
sensor_type	Type of sensor used for the temperature measurements
log_system	Type of logging system used
last_calib	Year of last calibration of the thermistor chain (YYYY)
data_access	Means of data access
changes	Information about major changes to the measurement configuration (not necessarily exhaustive!)

comment	Additional comments and possibly a reference to more detailed documentation of the installation
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

3.2 Data products

The temporal resolution of measured data differs between different installations and ranges from 1h to 24h. Available aggregation levels are: *day*, *month*, *year*, *hyear* (hydrological year).

Aggregation procedure:

- Daily means are calculated from the original data table *bht* and *gst* based on all original data with a quality flag ≤ 2 . The quality of the aggregated monthly and annual means is assessed based on the available number of values (count) as well as the maximum gap length. The threshold for accepting an aggregated value distinguishes three depth classes (near surface < 2 m / down to ZAA 2 m to < 20 m / deep ≥ 20 m). Only accepted values are included in the respective aggregation tables

3.2.1 *bht_day*

Borehole temperatures aggregated to daily resolution.

Field	Description
borehole_id	ID of the corresponding borehole
time	Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
depth	Depth of the measurement (m)
temp	Measured borehole temperature (°C)
t_min	Minimum borehole temperature in aggregation period (°C)
t_max	Maximum borehole temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

3.2.2 *bht_month*

Borehole temperatures aggregated to monthly resolution.

Field	Description
borehole_id	ID of the corresponding borehole
time	Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD HH:MM:SS)
depth	Depth of the measurement (m)
temp	Measured borehole temperature (°C)
t_min	Minimum borehole temperature in aggregation period (°C)
t_max	Maximum borehole temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

3.2.3 *bht_year*

Borehole temperatures aggregated to annual resolution based on calendar year.

Field	Description
borehole_id	ID of the corresponding borehole
time	Calendar year of measurement
depth	Depth of the measurement (m)
temp	Measured borehole temperature (°C)
t_min	Minimum borehole temperature in aggregation period (°C)
t_max	Maximum borehole temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

3.2.4 bht_hyear

Borehole temperatures aggregated to annual resolution based on the hydrological year. The hydrological year is defined from 01.10. to 30.09 and the hydrological year 2021 corresponds to the period 01.10.2020-30.09.2021.

Field	Description
borehole_id	ID of the corresponding borehole
time	Hydrological year of measurement
depth	Depth of the measurement (m)
temp	Measured borehole temperature (°C)
t_min	Minimum borehole temperature in aggregation period (°C)
t_max	Maximum borehole temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

3.2.5 ALT

The active layer thickness (ALT) for each year and borehole is calculated by linear interpolation between neighbouring sensors (sensors with positive and negative temperatures above and below the permafrost table).

Field	Description
id	Unambiguous identifier for the data point (primary key)
borehole_id	ID of the corresponding borehole
year	Year
alt	Maximum active layer thickness (m)
date	Date of the max ALT (YYYY-MM-DD)
guess	Set to 1 if ALT value is a guess by the PI or the PERMOS Office
upper_therm	Depth of upper thermistor used for the interpolation (m)
lower_therm	Depth of lower thermistor used for the interpolation (m)
comment	Additional information about the calculation of the max. ALT
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

4 GST tables

4.1 Metadata

4.1.1 gst_loc

Information on the locations of ground surface temperature (GST) measurements.

Field	Description
id	GST location ID (only used for reference within the database)
name	GST location name: site abbreviation, underscore, S (scree) or R (rock), consecutive number, e.g. SCH_R001
alter_name	Alternative name(s) of the GST location as used by PI
alter_name2	Alternative name(s) of the GST location
site_id	ID of the corresponding measurement site.
pi_id	ID of the responsible PI
year	Year, when the GST location was installed (YYYY)
active	Measurements ongoing? Either 1 or the year, when measurements were stopped (YYYY).
project	Network / project, the GST location is affiliated with
e	Exact location in Swiss national coordinates (LV03 reference frame) non-CH sites: -999
n	Exact location in Swiss national coordinates (LV03 reference frame) non-CH sites: -999
h	Altitude (m a.s.l.)
lat	Geographic coordinates, latitude (decimal degrees)
lon	Geographic coordinates, longitude (decimal degrees)
slp	Slope of the GST location (°)
asp	Aspect of the GST location (°) For flat locations: -999

morphology	Morphology of the measurement location [crest grassland moraine rock glacier solifluction lobe talus slope rock wall]
surf_type	Surface (material) at the measurement location [bedrock coarse blocks debris soil vegetation]
depth	Depth of the logger [m]
sky_view	Sky fraction (fraction 0–1) visible to the GST logger (measured on-site)
log_type	Type of logger device used
changes	Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	Additional comments
created_at	Date and time, when the data was included in the DB (YYYY-MM-DD HH:MM:SS)
updated_at	Date and time, when the row was last updated in the DB (YYYY-MM-DD HH:MM:SS). Updated with trigger function.

4.2 Data products

The temporal resolution of measured data differs between different installations and observation period. Available aggregation levels are: *day*, *month*, *year*, *hyear* (hydrological year)

Aggregation procedure:

- Daily means are calculated from the original data table based on all original data with a quality flag ≤ 2 . Monthly and annual data are calculated based on thresholds for the number of available values (count) and the maximum gap length. Only accepted values are included in the aggregation tables.

4.2.1 *gst_day*

GST aggregated to daily resolution.

Field	Description
gst_loc_id	ID of the corresponding gst location
time	Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD)
temp	Measured gst temperature (°C)
t_min	Minimum gst temperature in aggregation period (°C)
t_max	Maximum gst temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

4.2.2 *gst_month*

GST aggregated to monthly resolution.

Field	Description
gst_loc_id	ID of the corresponding gst location
time	Date and time of measurement in Central European Time (UTC+1, YYYY-MM-DD)
temp	Measured gst temperature (°C)
t_min	Minimum gst temperature in aggregation period (°C)
t_max	Maximum gst temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.
fdd	Freezing degree days index: sum of negative daily temperature during one month (°C)
tdd	Thawing degree days index: sum of positive daily temperature during one month (°C)

4.2.3 *gst_year*

GST aggregated to annual resolution based on calendar year.

Field	Description
gst_loc_id	ID of the corresponding gst location
time	Calendar year of the measurement (YYYY)
temp	Measured gst temperature (°C)
t_min	Minimum gst temperature in aggregation period (°C)
t_max	Maximum gst temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.

4.2.4 *gst_hyear*

GST aggregated to annual resolution based on hydrological year. The hydrological year is defined from 01.10. to 30.09 and the hydrological year 2021 corresponds to the period 01.10.2020-30.09.2021.

Field	Description
gst_loc_id	ID of the corresponding gst location
time	Hydrological year of the measurement (YYYY)
temp	Measured gst temperature (°C)
t_min	Minimum gst temperature in aggregation period (°C)
t_max	Maximum gst temperature in aggregation period (°C)
count	Number of measurements available for the calculation of the aggregated value.
fdd	Freezing degree days index: sum of negative daily temperature during one hydrological year (°C)
tdd	Thawing degree days index: sum of positive daily temperature during one hydrological year (°C)

5 TGS tables

5.1 *Metadata*

5.1.1 *tgssite*

Information on terrestrial geodetic surveys (TGS) on rock glaciers.

Field	Description
id	TGS site ID (only used for reference within the database)
name	TGS site name: site abbreviation, underscore, TGS, consecutive number, e.g. MUR_TGS1
alter_name	Alternative name(s) of the TGS site as used by the PI
site_id	ID of the corresponding measurement site.
pi_id	ID of the responsible PI
year	Year of start of measurements (YYYY)
active	Measurements ongoing? Either TRUE or FALSE
project	Network / project, the TGS location is affiliated with
e	Approximate location in Swiss national coordinates, east coordinate (LV03 reference frame) non-CH sites: – 999
n	Approximate location in Swiss national coordinates, north coordinate (LV03 reference frame) non-CH sites: – 999
h_min	Approximate altitude range (m a.s.l.) of the tgs site, min elevation
h_max	Approximate altitude range (m a.s.l.) of the tgs site, max elevation
lat	Geographic coordinates, latitude (decimal degrees)
lon	Geographic coordinates, longitude (decimal degrees)
asp	General aspect of the landform observed (S, SE, etc.)
morphology	Morphology of the measurement location
n_meas_year	Number of measurements per year, 0.5 means every second year
n_ref_points	Number of reference points
n_obs_points	Number of observed points (reference, monitoring and control points)
crs	Coordinate system/reference frame of TGS data in the DB: LV03 Swiss national coordinates in LV03 (y, x)

	LV95 Swiss national coordinates in LV95 (E, N) If not specified, by default crs is LV03
changes	Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	Additional comments and possibly a reference to more detailed documentation of the installation
method	Method of survey: TS total station dGPS differential GPS

5.1.2 tgs_point

Information on measurement points at the TGS sites.

Field	Description
id	TGS point ID (only used for reference within the database)
name	TGS point name: site abbreviation, underscore, consecutive number, consecutive letter (only if new points have been measured to substitute an existing one), e.g. GFU_202
alter_name	Alternative point name used by the PI
tgs_site_id	id of the corresponding TGS site
p_group	Name of the group of point constituting a coherent time series, e.g. GFU_302 and his replacement point GFU_302b constitute the group GFU_302
active	Is the point currently measured? t or f
zone	Zone on rock glacier, where the point is located, e.g front, center, rooting zone, zone1, etc.
type	Type of measurement point: 0: control point (stable, not moving points) 1: monitoring point (moving points not used as reference) 2: reference monitoring point (used to compute the site mean)
comment	Additional comments

5.1.3 tgs_survey

Information on individual surveys at the TGS sites.

Field	Description
id	TGS survey ID (only used for reference within the database)
tgs_site_id	ID of the corresponding tgs_site.
survey_date	Date of survey (YYYY-MM-DD)
e_corr	Easting correction value in metres (RAW - x)
n_corr	Northing correction value in metres (RAW - y)
h_corr	Elevation correction value in metres (RAW - z)
equipment	Equipment used for survey
operator	Full name of survey operator (first name last name)
uncertainty	Estimated uncertainty
espg	EPSG-NR. of Coordinate Reference System (CRS). Default: CH1903/LV03 (21781)
comment	Additional comments
corr_point_id	array with all ids of tgs_point used for correction

5.2 Data product

5.2.1 tgs_data

The location of each surveyed tgs_point is stored. E and N coordinates and H values are corrected when necessary using the E_corr, N_corr and H_corr values, respectively, that are stored in the table tgs_survey.

Field	Description
Id	TGS data ID (only used for reference within the database)
Site_name	TGS site name: site abbreviation, underscore, TGS, consecutive number, e.g. MUR_TGS1
point_name	TGS point name: site abbreviation, underscore, consecutive number, consecutive letter Inherited from the table tgs_point (name)
Survey_date	Date of survey (YYYY-MM-DD)
e	Exact location in Swiss national coordinates, east coordinate (LV03 reference frame) non-CH sites: -999 Corrected using e_corr from the tgs_survey table
n	Exact location in Swiss national coordinates, north coordinate (LV03 reference frame) non-CH sites: -999 Corrected using n_corr from the tgs_survey table
h	Exact altitude (m a.s.l.) of the surveyed point at the date of the survey Corrected using h_corr from the tgs_survey table

6 ERT tables

6.1 Metadata

6.1.1 ert_site

Information about the sites, where electrical resistivity tomography (ERT) profiles are present.

Field	Description
id	ERT site ID (only used for reference within the database)
name	ERT site name: site abbreviation, underscore, V (vertical) or H (horizontal), consecutive number, e.g. SCH_H1.
alter_name	Alternative (file) name(s) of the ERT profile as used by the PI
site_id	ID of the corresponding PERMOS measurement site.
pi_id	ID of the responsible PI
year	Year of start of measurements (YYYY)
surf_type	Surface (material) at the measurement location
ert_add	Additional ERT-measurements are available (t=TRUE, f=FALSE)
rst	Seismic profile(s) along this ERT profile (t=TRUE, f=FALSE)
pf_x1	X coordinate of the upper left corner of the ZOI (distance in meters in true horizontal)
pf_z1	Z coordinate of the upper left corner of the ZOI (depth in meters relative to the topography)
pf_x2	X coordinate of the upper right corner of the ZOI (distance in meters in true horizontal)
pf_z2	Z coordinate of the upper right corner of the ZOI (depth in meters relative to the topography)
pf_x3	X coordinate of the lower right corner of the ZOI (distance in meters in true horizontal)
pf_z3	Z coordinate of the lower right corner of the ZOI (depth in meters relative to the topography)
pf_x4	X coordinate of the lower left corner of the ZOI (distance in meters in true horizontal)
pf_z4	Z coordinate of the lower left corner of the ZOI (depth in meters relative to the topography)

6.1.2 ert_profile

Information about the profiles along which electrical resistivity tomography (ERT) surveys are performed.

Field	Description
id	ERT profile ID (only used for reference within the database)
name	ERT profile name: ert_site abbreviation, underscore consecutive number (i.e. number of the profile) e.g. SCH_H1_1.
ert_site_id	ID of the corresponding ert site.
start_date	Date of the first measurement on this profile (YYYY-MM-DD)
active	Measurements ongoing? t = TRUE, f = FALSE

n_elec	Number of electrodes in the ERT profile
spacing	Spacing of the electrodes (m)
e_first	Exact location in Swiss national coordinates of first electrode, east coordinate (LV03 reference frame) non-CH sites: -999
n_first	Exact location in Swiss national coordinates of first electrode, north coordinate (LV03 reference frame) non-CH sites: -999
h_first	Altitude of first electrode (m a.s.l.)
e_last	Exact location in Swiss national coordinates of last electrode, east coordinate (LV03 reference frame) non-CH sites: -999
n_last	Exact location in Swiss national coordinates, north coordinate (LV03 reference frame) of last electrode non-CH sites: -999
h_last	Altitude of last electrode (m a.s.l.)
bh1	Name of BH1 along the profile (used for plotting)
bh1_dist	Horizontal distance of BH1 along ERT-Profile from first electrode (m)
bh2	Name of BH2 along the profile (used for plotting)
bh2_dist	Horizontal distance of BH2 along ERT-Profile from first electrode (m)
bh3	Name of BH3 along the profile (used for plotting)
bh3_dist	Horizontal distance of BH3 along ERT-Profile from first electrode (m)
aert	Automated ERT monitoring (t=TRUE, f=FALSE)
changes	Information about major changes to the measurement configuration (not necessarily exhaustive!)
comment	Additional comments and possibly a reference to more detailed documentation of the installation

6.1.3 ert_survey

Information about the survey performed along the electrical resistivity tomography (ERT) profiles.

Field	Description
id	ERT survey ID (only used for reference within the database)
ert_profile_id	ID of the corresponding ERT profile.
survey_date	Date of the measurement (format YYYY-MM-DD)
config	Configuration of survey: 1: Wenner 3: Dipole-Dipole 7: Wenner-Schlumberger
Survey_type	Type of measurement: 1: monitoring survey 2: annual reference survey
quality	Quality of the ERT survey (bad = 'f' or good = 't'). The quality is defined according to the automatic filtering procedure defined in Mollaret et al. 2019 ¹ . (good > 80% of data left, bad < 80% of data left)
rms	Root Mean Squared (RMS) error of the inversion model. Value is only given for quality = 't'
rst	Additional RST measurements available along the same profile at the same date (t=TRUE, f=FALSE)
operator	Full name of survey operator (first name last name)
instrument	Instrument used for survey
Comment	Additional comments and possibly a reference to more detailed documentation of the survey

¹ Mollaret, C., Hilbich, C., Pellet, C., Flores-Orozco, A., Delaloye, R., & Hauck, C. (2019). Mountain permafrost degradation documented through a network of permanent electrical resistivity tomography sites. The Cryosphere, 13(10), 2557–2578. <https://doi.org/10.5194/tc-13-2557-2019>

6.1.4 ert_topo

Topography data of the ERT sites. An ERT site can be composed of several profiles of different electrode spacing and length located along the same line (ert_site). The topography is given for the total length of the line (ert_site). The measurements correspond to the electrode locations except for ert_site_id = 2 where measurements are taken at and in between each electrode.

Field	Description
id	ERT topography point ID (only used for reference within the database)
ert_site_id	ID of the corresponding ERT site.
x	Horizontal distance (true horizontal) from first electrode (m)
z	Height of electrode (m). Heights can be given as absolute or relative values

6.2 Data products

6.2.1 ert_raw

Measured apparent resistivity data along the ERT profiles. The data within this table are *raw* (i.e. measured apparent resistivity) data and they have not been processed in any way

Field	Description
id	ERT raw measurement ID (only used for reference within the database)
Ert_profile_id	ID of the corresponding ERT profile.
Survey_date	Date of the measurement (format YYYY-MM-DD)
c1	Horizontal distance (along the surface) of the first current electrode relative to the first electrode of the profile (m)
c2	Horizontal distance (along the surface) of the second current electrode relative to the first electrode of the profile (m)
p1	Horizontal distance (along the surface) of the first potential electrode relative to the first electrode of the profile (m)
p2	Horizontal distance (along the surface) of the second potential electrode relative to the first electrode of the profile (m)
rho_a	Measured apparent resistivity (Ohm m)